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ABSTRACT

In 1996 the National Science Foundation undertook a review of comprehensive curriculum projects in middle school science. The purpose of this document is to highlight the framework for the review developed to examine the middle school materials and the results of the panel's findings. Findings indicate that 13 of the 19 projects examined had panel ratings of three or higher on the 1-5 point scale of the Inverness Research Framework for Review, with 1 as "low" and 5 as "high" on overall quality. Topics discussed include content, pedagogy, assessment, equity, and implementation. Key findings include: (1) most materials do not explicitly address strategies for improving the performance of a diverse set of students through attention to differences in ability, learning style, etc.; (2) among the content areas, Earth Science appears least frequently; (3) connections between science and mathematics were not developed in most of the materials; (4) the weakest area in the set of materials relative to the science standards is lack of sufficient focus on the history and nature of science; and (5) too few materials incorporate significant and appropriate use of instructional technologies such as ensuring that the materials are presented in a variety of formats. Appendices contain the framework for the review and descriptions of each set of the instructional materials that are discussed in this report. (JRH)

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National Science Foundation
Directorate for Education and Human Resources

Review of Instructional Materials for Middle School Science

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Division of Elementary, Secondary, and Informal Education

February 1997

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National Science Foundation
Directorate for Education and Human Resources

Review of Instructional Materials for Middle School Science

Division of Elementary, Secondary, and Informal Education

February 1997

PREFACE

In 1996 the National Science Foundation (NSF) undertook a study of comprehensive (at least one year) instructional materials for science in the NSF portfolio encompassing the middle school years. This middle school review was the first effort to examine a range of projects for a particular set of grades. This paper describes both the process and the results of that study.

One of the major goals of NSF is to provide the field with high quality instructional materials that incorporate the best research on teaching and learning, include accurate science and the active participation of scientists in the development process, and have undergone an extensive pilot and field test process. Support of such materials enables teachers, schools, and districts to have access to materials that provide students with the experiences that will lead to an understanding and mastery of scientific concepts and processes.

The Division of Elementary, Secondary, and Informal Education (ESIE) in the Directorate for Education and Human Resources supports the development of instructional materials for grades K-12. The program staff of ESIE hope that this publication will be useful to teachers, science supervisors, and other administrators responsible for making curriculum decisions for their schools and districts.

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National Science Foundation
Review of Instructional Materials for Middle School Science

In 1996, the National Science Foundation (NSF) undertook a review of comprehensive curriculum projects in middle school science. As work on the study progressed, it became clear that the framework for review developed to examine the middle school materials and the results of the panel's findings might be helpful beyond NSF, and could be useful for those in the field working to improve science education in schools, districts, and states. The purpose of this paper is to make such information available to this broader audience.

Introduction

Unlike earlier school reforms, current reforms focus on identifying what all students should know and be able to do. Efforts such as NSF's Systemic Initiatives aim to create bold new visions of curriculum, assessment, and pedagogy to improve education for all children. The frameworks for these reforms are often found in national standards such as those from the National Council of Teachers of Mathematics (NCTM), and the National Academy of Sciences' National Science Education Standards (NSES). These national frameworks were largely grass roots efforts with contributions from teachers, parents, school administrators, and scientists and mathematicians. They represent consensus views on what content is most important to teach, suggestions for teachers about effective instructional strategies, suggestions for how to assess student learning, and in the case of the NSES, suggestions for implementation. In addition, the American Association for the Advancement of Science (AAAS) has developed *Benchmarks for Science Literacy*, a compendium of specific science literacy goals developed by scientists and educators that states, districts, and schools can use as a guide for a science curriculum.

Many states and districts have developed curriculum frameworks in mathematics and science that build on or adapt these standards efforts. The question now is, do we have the tools required to successfully transverse the new educational terrain? The national standards and state frameworks perhaps set the compass and provide a large-scale map, but it falls on districts, schools, and teachers to identify the best materials and programs to make reform a reality. Without quality instructional materials even the best teachers can make little headway.

To investigate the current status of instructional materials, NSF conducted a review of its portfolio of comprehensive curricula for middle school science (grades 5-9) in early 1996. The justification for starting with middle level science included the following:

- Earlier NSF funded projects had resulted in several sets of comprehensive materials at the elementary level.
- There were questions both in the field and at NSF about the availability of quality comprehensive materials for middle school students.

- There were several sets of middle school materials at or near completion, and therefore ready for review.

The purpose of the Middle School Science Study was to answer the following questions:

1. What are the characteristics of the portfolio of comprehensive instructional materials for middle school science developed with NSF funds?
2. How sufficiently do these materials provide for a comprehensive program for middle school science consistent with the national standards for science education?

The study included a review of comprehensive curricula, those that equal a year or more of course material, produced during the past decade or that were currently under development. The central criteria used in reviewing the instructional materials were as follows:

1. Is the science content correct?
2. How well do the materials provide for conceptual growth in science?
3. How well do the materials align with the National Science Education Standards?

Rationale and Background

Overview and History of NSF's Instructional Materials Development Program (IMD)

It is NSF's goal to "achieve excellence in U.S. science, mathematics, engineering and technology education at all levels."[1] One of the strategies to meet this goal is to fund development of high quality instructional materials with potential for national impact that are consistent with state and national standards. NSF, through the IMD Program, supports the development of new comprehensive materials, development of new instructional units, and revisions of existing high quality materials.

Developing high quality instructional materials is an expensive and long-term process, requiring contributions from numerous teachers, scientists, and mathematicians to ensure that the content and pedagogy are current and correct. Materials should contain activities that are engaging and relevant for students, and provide sufficient guidance for teachers so that they can be implemented successfully in classrooms. Materials must provide for extensive pilot and field testing with diverse student populations, and this often means time-consuming revisions. Materials supported by NSF are often under development for five or more years before they are ready for publication. High quality instructional materials are a critical component of the reform effort. Reform is not possible without materials that contain cutting-edge science, provide for students' conceptual growth over time, and contain engaging reading, experiments, and opportunities for teacher-directed and student inquiry.

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[1] *NSF in a Changing World*, National Science Foundation, Arlington, VA (NSF95-24).

In sum, the IMD Program seeks projects that:

- Involve collaborations of scientists, mathematicians, teachers, and educators.
- Apply current research in teaching and learning.
- Align with standards.
- Contain embedded student assessments that help inform instruction and use a variety of strategies to assess student learning.
- Field test materials in diverse settings.
- Employ formative and summative evaluations, that include student outcome data from field test sites.[2]

Overview of Science Materials Reform

Unlike mathematics, where NSF funded a portfolio of projects to develop comprehensive instructional materials following the release of the *National Council of Teachers of Mathematics Standards for Content and Evaluation* in 1989[3], NSF began funding the development of innovative comprehensive instructional materials in science a decade prior to the release of the science standards. The American Association for the Advancement of Science (AAAS) released *Benchmarks for Science Literacy*[4] in 1993, and the National Academy of Sciences/National Research Council published the *National Science Education Standards (NSES)*[5] in December, 1995. Therefore, many of the middle school projects reviewed in this study predate these standards. Many curriculum developers, however, served on the working groups that developed the *Benchmarks* and standards, participated in the extensive review and critique of the science standards, and incorporated ideas emerging from these standards-based projects into their materials.

The current cycle of development of instructional science materials, dating from the mid 1980s was driven by: (1) the need to ensure that there were effective materials available, particularly at the elementary level, where science was frequently relegated to "the last 20 minutes on Friday afternoon;" (2) the need to develop materials that provided more "hands-on" opportunities for students to actively conduct their own observations and experiments, and to generate their own questions under teacher guidance; and (3) the need to incorporate new research findings in teaching and learning into science instructional materials.

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[2]National Science Foundation: *Elementary, Secondary, and Informal Education. Program Announcement and Guidelines, 97-20.*

[3]National Council of Teachers of Mathematics *Content and Evaluation Standards*, Reston VA 1989.

[4]American Association for the Advancement of Science, project 2061, *Benchmarks for Science Literacy*, Oxford University Press, New York, 1993.

[5]National Research Council of the National Academy of Science, *National Science Education Standards*, Academy Press, 1995.

In the mid 1980s, NSF funded hands-on materials at the elementary level, through the *TRIAD* projects. These projects formed partnerships between three critical groups - publishers, developers, and school districts, and operated on the assumption that the availability of high quality elementary science materials would motivate teachers to teach science using a "hands-on" and inquiry-based approach. Shortly thereafter work began on developing middle school materials, and this was followed by work on high school materials, many of which are now nearing completion.[6]

NSF has refined its ideas about what constitutes good instructional materials development. NSF increasingly is concerned that materials provide appropriate guidance for teachers, suggest appropriate instructional strategies, contain a variety of assessment activities, accommodate the diversity of students, and contain suggestions for implementation. The review instrument developed by Inverness Research and modified by NSF for use in the Middle School Study, reflects the Foundation's concern with assessing a wide range of features in addition to high quality content.

Procedures of the Middle School Science Study

The Middle School Science Study adapted NSF's peer review process to critique the portfolio of comprehensive curricula, using a method similar to the one the IMD program uses for reviewing proposals for new projects. In this peer review process, panels of outstanding scientists, mathematicians, and educators critique proposals submitted for funding and make recommendations to the NSF about the proposal's quality, funding priority, and potential impact. Typically, reviewers provide individual written reviews, discuss the proposals in panel meetings and develop a panel summary for each proposal. This study followed a four-step process in completing the review of materials: (1) training; (2) independent review; (3) summary and consensus; and (4) synthesis.

Training

A review panel of 20 experts consisting of scientists, science and technology educators, and science teachers participated in the peer review process. For the peer review, program directors from ESIE met with the panel of experts to agree on the process and criteria for reviewing the materials. The panel used an instrument developed by Inverness Research to review one instructional module as a trial run to calibrate the review process. Following the trial review, the panel critiqued and revised the instrument to develop a common understanding for each item and to agree on the review process. Appendix A includes a copy of the final review instrument, called the *Framework for Review*.

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[6]Cozzens, Margaret, *Instructional Materials Development (IMD): A Review of the IMD Program, Past, Present, and Future*, unpublished paper, National Science Foundation, 1996.

Independent Review

Following the panel meeting, panel members were formed into small working groups, consisting of a scientist, science educator, practitioner, and those with expertise in assessment and implementation. Panel members read their assigned portions of the curriculum materials at home and prepared in-depth analyses of the materials using the review instrument as a framework to guide the critiques. The panel members were asked to provide detailed comments to justify each rating for each item of the instrument.

Panel Summary

The panel members returned to NSF and exchanged results in their working groups. Each working group prepared a written summary for each program representing a consensus of their reviews. Each panel provided feedback on the review instrument and the review process, which NSF staff used to revise the instrument for future use. New summary groups were formed to discuss cross-cutting issues: (1) treatment of science content, (2) approach to teaching, (3) approach to assessment and equity, and (4) strategies for implementation. Each summary group reported to the whole panel, and a large-group discussion developed the major summary findings of the overall peer review.

Synthesis

A second panel of experts was convened to review the process and findings of the peer review, to develop strategies for disseminating the findings, and to recommend future directions. The synthesis panel was constituted with 14 members, including four members from the peer review panel. The synthesis panel included scientists, teachers, curriculum developers, and national and state leaders in the reform of science, mathematics, and technology education. The synthesis panel carefully reviewed the panel summaries and summary recommendations from the peer review process and developed an overall synthesis of findings that are the basis for this report.

Constraints

The review procedures were designed to provide a broad-brush assessment of the status of the portfolio of NSF funded comprehensive instructional materials for middle school science. The purpose of the activity was to identify strengths and weaknesses in the portfolio, as well as gaps requiring the development or revision of projects. The Study was to provide feedback to program officers who review proposals.

The Study was **not** designed to provide an NSF vision of a national curriculum, thoroughly evaluate individual projects, provide a "consumer report" of quality of curricula, or survey the needs of teachers and schools.

The Study had several constraints:

- In most cases, the complete set of materials for one comprehensive program was not reviewed by all members of the panel. Therefore, each panel member completed the individual review based on only a subset of the full package of materials.

- No materials were reviewed by more than one panel; thus it was not possible to equate a particular value on an item for one set of materials given by one panel with a value for the same item given by a different panel to another set of materials.

- Panel members analyzed, in general terms, the degree to which a set of materials addressed content standards within particular science disciplines, but did not do a fine-grained analysis of specific concepts and the amount of time allocated to mastery of those specific concepts.

The results of the Study has shed light on the current status of middle school science instructional materials developed with NSF funding, but they do not serve as a detailed evaluation of individual projects. It is hoped that the results of the study will be used to inform state and local administrators, curriculum developers, principal investigators of systemic reform and teacher enhancement projects, and NSF program officers about quality, standards-based instructional materials for middle school science. The review instrument developed as part of this study is an important product for use by those who select materials for school science programs.

Results

Overall

Thirteen of the nineteen projects examined as part of NSF's Middle School Review had panel ratings of 3 or higher on a 1-5 point scale of the Inverness Research *Framework for Review*, with 1 as "low" and 5 as "high" on overall quality. Eight of these--*Prime Science (6-10), Science 2000 (6-8), Science and Technology: Investigating Human Dimensions (BSCS, 6-8), Full Option Science System (FOSS 5-6), Science and Technology for Children (5-6), Improving Urban Elementary Science(Insights 5-6), Elementary School Science and Health Materials (BSCS 5-6), and Integrated Mathematics, Science, and Technology (IMaST 7-8)* are multi-year comprehensive programs. *Event-Based Science*, and *Junior High/Middle School Life Science Program (Jeffco)* comprise materials for one year. *Science Education for Public Understanding Program (SEPUP)* and its predecessor, *Chemical Education for Public Understanding Project (CEPUP)* cover nonsequential multiple single years of material, and a third set of materials, *Life Science for Public Understanding Project,* is currently under development in order to complete a comprehensive grade 7-10 series. *National Geographic Kids Network* (4-6) covers multiple grade levels, but is not designed to cover a full year of science at any grade level. Thus, the answer to the question regarding the availability of

high quality, standards-based middle school science materials is that there are some good comprehensive programs. Also, one year programs can form important components of a total middle school program. (See Appendix B for brief descriptions of each of these projects).

Content

Science content in middle schools includes important scientific concepts in earth, biological, and physical sciences, opportunities for inquiry, and information on the history and processes of science. Particular programs stand out as having strengths in particular areas. These programs have the potential of serving as exemplars for curriculum developers in the design of new materials, and for school districts who are forming school science programs.

Projects vary in their approach to content. A few developers have produced multi-year comprehensive programs designed to achieve all of the content standards for the middle level. These programs have been forced to face the challenge of finding the best balance between breadth and depth of science content. One example, *PRIME Science*, provides a balanced curriculum covering biological, earth, and physical science for grades 6-10, and revisits important concepts so students deepen their understanding of key ideas. Another example, *Science 2000*, was rated high for its alignment with the National Science Education Standards content standards and its development of key science concepts. *Science 2000* is unique in that it is organized around a few major conceptual themes, and it has separate units on science and technology. *Integrated Mathematics, Science, and Technology (IMaST)* stands alone as a program that is designed to integrate the teaching of science and mathematics with technology. *IMaST* is to be taught by a team of mathematics, science, and technology teachers in a three-hour block to enable students to achieve the content standards in science and mathematics for the middle grades, with a grounding in technology education as well.

Single-year programs for the middle grades do not propose to meet all of the content standards for grades 5-9. Programs of this type either have developed materials aligned with a discipline-based approach (e.g., *Junior High/Middle School Life Science*, or *Event-Based Science: Earth Science*) or they have taken a problem/issue-centered approach that may transcend science disciplines *(CEPUP and SEPUP). Event-Based Science: Earth Science* takes both approaches in that it is a problem-centered approach designed to teach the traditional content of earth science. *Event-Based Science* was rated high in its presentation of science content, and was one of the few programs that addressed earth science. It effectively uses video of natural disasters (e.g., earthquakes, tornadoes, floods) to engage students in investigating the content and processes of earth science. The strength of the single-year approach is that a school district could build its own multi-year program by selecting single-year programs that fit their curriculum framework.

Comprehensive programs for grades 5-6 which are part of a K-6 program, are challenged with the need to be both scientifically meaningful and developmentally appropriate for young students. *The Full Option Science System (FOSS)* for grades 5-6 is an example of the effective treatment of science content at this level. *FOSS* strikes a good balance between an emphasis on the major conceptual themes, such as systems, and an emphasis on science concepts, such as an electrical circuit. The reviewers felt that *FOSS* presents important current science content accurately, at a developmentally appropriate level and covers appropriate breadth of science and depth of understanding.

Pedagogy

Good materials contain suggestions for teachers such as the sequencing of activities to achieve desired student learning results, and hints on working with groups of students. Particular programs have the potential of serving as exemplars for particular areas related to pedagogy. From the category of multi-year comprehensive programs, *PRIME Science*, was rated highly by the panel for overall quality of pedagogical design. The panel members were especially impressed with the manner in which *PRIME Science* presented a logical progression of the development of conceptual understanding that reflects researchers current understanding of teaching and learning of science. *Science and Technology for Children* is a K-6 program that received high marks for engaging students in doing science inquiry and technology problem solving. *CEPUP* was recognized as providing a good model for using personal and social issues as the pedagogical driver for engaging students in learning and applying important science concepts. *National Geographic Kids Network* is unique in its effective use of telecommunications to engage students in collaborative science investigations, and *Science 2000* provides a model for using interactive videodisk technology to engage students in learning science content.

Assessment

While classroom assessment is an important component of instructional materials, some of the materials (particularly those funded before the early 1990s) contained limited assessment activities. Other projects appeared to include assessment as an afterthought. It is now believed that assessments should be developed concurrently with, and embedded in, the instructional materials. Some materials, such as *Junior High/Middle School Life Science (Jeffco)*, contain traditional assessments (paper and pencil tests), but they are well done. Others greatly expanded on this traditional base by including assessments where students demonstrate through performance or extended response questions what they know and are able to do. *Event-Based Science*, for example, was regarded as being very user-friendly for teachers, and has excellent scoring rubrics that are related to the ongoing instructional themes. At the elementary level, *FOSS, Insights*, and *Science and Technology for Children* include embedded assessments that are integral to instruction, and use a variety of approaches to test student understanding. *SEPUP* was cited as an outstanding example of embedded assessment at the middle school level. *National Geographic Kids Network* also included innovative uses of performance assessment that are linked to computer network communications.

Equity

Panel members described the approaches to equity in these materials as more likely to commit sins of omission than commission. Many of the materials simply do not address equity issues in any explicit way, although there is no obvious bias in the materials. Panel members felt that almost all of the materials would benefit from an explicit focus on equity issues, with concrete suggestions for how teachers can gain access to needed materials and supplies, and an understanding that programs that rely on complex technologies may be expensive and thereby excluded in many schools and districts at the current time. Supplemental materials are needed that address how to use heterogeneous student groups effectively and that explain the importance of accommodating various learning styles. These materials may be produced by others than the curriculum developers.

Panel members lauded materials that focused on societal issues, such as *Event-Based Science*, *SEPUP,* and *Middle School Science and Technology (BSCS 6-8*) as having an inclusionary effect, because they address many issues that use events and materials familiar and relevant to students. These integrated approaches provide access to important scientific ideas. Both sets of materials also discuss student learning styles and suggest cooperative learning strategies.

Implementation

Most of the materials packages in the review did not address dissemination or implementation issues and this is critical in focusing schools and districts on strategies for scaling projects up, exerting quality control, aligning curriculum, professional development, and assessment, working effectively with parents and other community members, etc.. Notable exceptions in this regard were the implementation guides including *Middle School Science and Technology (BSCS 6-8)* and *Junior High/Middle School Life Science Program (Jeffco).* Specific suggestions and strategies are provided for adopting new approaches for appropriate professional development, suggestions for scope and sequence of content, and for evaluating the effectiveness of implementation of the materials. None of the materials packages mentioned how to work with parents or the public.

Conclusions

There are a number of high quality middle school science curricula available and some are comprehensive. With care, schools and districts can create good middle school science programs with these materials.

A few key findings are:

- Most of the 13 sets of materials rated 3 or higher on the 5 point scale are generally consistent with the national science content standards.

- The emphasis on science literacy for **all** students brings attention to the importance of applying equity principles, but most materials do not explicitly address strategies for improving the performance of a diverse set of students through attention to differences in ability, learning style, etc. Additional supplemental materials may be needed to provide good strategies.

- Among the content areas, earth science appears least frequently.

- Connections between science and mathematics were not developed in most of the materials.

- The weakest area in the set of materials relative to the science standards is lack of sufficient focus on the history and nature of science.

- Too few materials incorporate significant and appropriate use of instructional technologies, such as ensuring that materials are presented in a variety of formats.

APPENDIX A

NATIONAL SCIENCE FOUNDATION
Framework for Review
Instructional Materials for Middle School Science[7]

Title: _____ _____
Author(s): _____
Publisher: _____ ***Copyright date:*** _____
Reviewed by _____ ***Date:*** _____

I. Descriptors

a. Write a brief description of the components of the curriculum upon which this review is based (e.g., teachers guide, student books, hands-on materials, multimedia material):

b. Write a brief description of the purpose and broad goals of these materials.

c. What grade levels do the materials serve?

___5 ___6 ___7 ___8 ___9

c. Are the instructional materials designed to

___ provide a complete multi-year program for middle school science.
___ provide a complete one-year course for middle school science.
___ provide multiple modules or units that could be used to supplement other course materials for middle school science.
___ provide a single module or collection of activities that could be used to supplement other course materials for middle school science.
___ other (explain):_____

d. What are the major domains/topics of content covered by these materials?

II. Quality of the Science

Directions: For each item, place an x on the line corresponding with your response to the question. ***Write an explanation for your rating of each item below the item.***

a. Does the content in the instructional materials align well with all eight areas of the Content Standards as described in the National Science Education Standards (NSES)?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

Omits substantial content included in NSES and/or includes substantial content not recommended in NSES	Some misalignment of content with NSES	The curriculum aligns well with content recommendations in NSES

[7] *NOTE: This framework is adapted from an instrument developed by Inverness Research under contract to the National Science Foundation. The framework was refined as part of a panel review of NSF-supported materials for middle school science, which was limited to projects that provide at least a year-long course of study.*

b. Are the science concepts presented in the instructional materials accurate and correct? [Provide examples of major errors where they are evident. Attach extra page if necessary]

1 . . . . . 2 . . . . . 3 . . . . . 4 5

Substantial, major errors	Mostly correct, with some minor errors	Scientifically accurate, and correct

c. Do the instructional materials adequately present the unifying concepts and adequately demonstrate and model the processes of science?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

Unifying concepts & processes not addressed	Somewhat addressed	Unifying concepts & processes addressed well

d. Does the science presented in the instructional materials reflect current disciplinary knowledge?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

The ideas are out of date	Largely current	Scientifically current

e. Do the instructional materials accurately represent views of science inquiry as described in the National Science Education Standards?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

Poor portrayal of inquiry	Mixed quality	Rich and accurate portrayal of inquiry

____Not a focus of these materials (explain)

f. Do the instructional materials accurately present the history of science?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

Poor portrayal of history of science	Mixed quality	Rich and accurate portrayal of history of science

____Not a focus of these materials (explain)

g. Do the materials emphasize technology as an area of study?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

Little or no emphasis	Some emphasis	Rich and well designed emphasis

____Not a focus of these materials (explain)

h. Do the materials emphasize the personal and societal dimensions of science?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

Little or no emphasis	Some emphasis	Rich and well designed emphasis

____Not a focus of these materials (explain)

i. Do the materials emphasize the content of life science?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

Little or no emphasis	Some emphasis	Rich and well designed emphasis

____Not a focus of these materials (explain)

j. Do the materials emphasize the content of earth science?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

Little or no emphasis	Some emphasis	Rich and well designed emphasis

____Not a focus of these materials (explain)

k. Do the materials emphasize the content of physical science?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

Little or no emphasis	Some emphasis	Rich and well designed emphasis

____Not a focus of these materials (explain)

l. Do the instructional materials provide sufficient activities for students to develop a good understanding of key science concepts?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

Too many concepts and few learning activities	Activities provide some opportunity for students to learn some important concepts	Activities provide many rich opportunities to learn key science concepts

m. Do the instructional materials provide sufficient opportunities for students to apply their understanding of the concepts (i.e., designing of solutions to problems or issues).

1 . . . . . 2 . . . . . 3 . . . . . 4 5

Very few application activities	Some	Very rich in application activities

n. Do the instructional materials present an accurate picture of the nature of science as a dynamic endeavor?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

The image of science is out-of-date, inaccurate or non-existent.	The image of science is of mixed quality.	The image of science is current and accurate.

o. Do the materials develop an appropriate **breadth and depth** of science content?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

Too narrow	Good balance of breadth and depth	Too broad

p. What is the overall quality of the science presented in the instructional materials?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

Low	Medium	High

IV. The Pedagogical Design

a. Do the instructional materials provide a logical progression for developing conceptual understanding in science?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

No logical development of ideas	Logical, progressive development of ideas	Logical, progressive development of ideas that builds conceptual understanding

b. Do the instructional materials provide students the opportunity to make conjectures, gather evidence, and develop arguments to support, reject, and revise their explanations for natural phenomena?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

No opportunity	Some opportunity	Rich and well designed opportunity

c. To what extent do the instructional materials engage students in doing science inquiry?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

Very few or very contrived activities for students to do science inquiry	Some good inquiry activities for students	Many rich and authentic opportunities for students to do science inquiry

d. To what extent do the instructional materials engage students in doing technology problem solving?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

Very few or very contrived activities for students to do technology	Some good technology activities for students	Many rich and authentic opportunities for students to do technology

e. To what extent does the curriculum engage students in activities that help them connect science to everyday issues and events?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

Very few or very contrived activities for students to make connections	Some good activities for students to make connections	Many rich and authentic opportunities for students to make connections

f. How would you rate the overall developmental appropriateness of the instructional materials, given its intended audience of **ALL** students at the targeted level(s)?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

Not developmentally appropriate	Somewhat appropriate	Developmentally appropriate

g. Do the materials reflect current knowledge about effective teaching and learning practices (e.g. active learning, inquiry, community of learners) based on research related to science education?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

Do not reflect current knowledge about teaching and learning	Somewhat reflective of current knowledge about teaching and learning	Reflect well current knowledge about teaching and learning

h. Do the instructional materials provide students the opportunity to clarify, refine, and consolidate their ideas, and to communicate them through multiple modes?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

No opportunity	Some opportunity	Rich and well designed opportunity

i. Do the instructional materials provide students the opportunity to think and communicate mathematically?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

No opportunity	Some opportunity	Rich and well designed opportunity

j. Do the instructional materials provide students with activities connecting science with other subject areas?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

No opportunity	Some opportunity	Rich and well designed opportunity

k. Are the instructional materials likely to be interesting, engaging, and effective for girls and for boys?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

Gender biased	Some sensitivity to gender issues	Equally interesting, engaging, and effective for girls and boys

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l. Are the instructional materials likely to be interesting, engaging, and effective for underrepresented and underserved students (e.g. gender, ethnic, urban, rural, with disabilities)?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

Biased	Some sensitivity to underrepresented and underserved students	Equally interesting, engaging, and effective for underrepresented and underserved students

m. Assessment has explicit purposes connected to decisions to be made by teachers (e.g., prior knowledge, conceptual understanding, grades).

1 . . . . . 2 . . . . . 3 . . . . . 4 5

Unclear purposes	Somewhat clear	Clear statement of purposes

n. Assessment focuses on the curriculum's important content and skills.

1 . . . . . 2 . . . . . 3 . . . . . 4 5

Poor correspondence	Fair correspondence	Full correspondence

o. Do the instructional materials include multiple kinds of assessments (e.g., performance, paper/pencil, portfolios, student interviews, embedded, projects)?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

Little or no student assessment provided	Some variety of student assessment	Complete student assessment package

p. Are the assessment practices fair to all students?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

Fair for a few	Fair to most	Fair to all

q. Are the assessment practices technically sound?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

Not sound	Somewhat sound	Technically sound

r. Do the instructional materials include adequate and appropriate uses of a variety of educational technologies (e.g., video, computers, telecommunications)?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

Little or no educational technology included	Some educational technology included	Rich and useful applications of educational technology included

s. What is the overall quality of the pedagogical design of these instructional materials?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

Low	Medium	High

V. Implementation and System Support

a. Will the teachers find the materials interesting and engaging?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

Dry & boring	Somewhat interesting & engaging	Interesting & engaging

b Do the instructional materials include information and guidance to assist the teacher in implementing the lessons?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

No teacher support	Some teacher support	Rich and useful teacher support

c. Do the instructional materials provide information about the kind of resources and support system required to facilitate the district implementation of the required science materials?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

No materials support	Some materials support	Rich and useful materials support

d. Do the instructional materials provide information about how to establish a safe science learning environment?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

No safety information	Some safety information	Rich and useful safety information

e. Do the instructional materials provide information about the kind of professional development experiences needed by teachers to implement the materials?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

Little or no information provided	Partial information provided	Rich and useful information provided

f. Do the materials provide guidance in how to link the materials with the district and state assessment frameworks and programs?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

No guidance	Some guidance	Rich and useful guidance

g. Do the materials provide guidance and assistance for involving administrators, parents, and the community at large actively in supporting school science?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

No guidance	Some guidance	Rich and useful guidance

h. Overall, are the materials usable by, realistic in expectations of, and supportive of teachers?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

Teacher unfriendly	Somewhat teacher friendly	Teacher friendly

VI. Major Strengths and Weaknesses

a. In your opinion what are the three major strengths of this curriculum?

b. In your opinion, what are the three major weaknesses of this curriculum?

VII. Overall Quality, Value, and Contribution

a. In your opinion what is the overall quality of these materials relative to:

	low				high
- turning students on to science?	1	2	3	4	5
- making students think?	1	2	3	4	5
- quality of science content?	1	2	3	4	5
- quality of pedagogy?	1	2	3	4	5
- quality of classroom assessments?	1	2	3	4	5
- pushing teachers to teach differently?	1	2	3	4	5

b. In your opinion, what is the overall quality of these instructional materials?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

Low Medium High

c. To what extent would you encourage the dissemination, adoption, and implementation of this curriculum?

1 . . . . . 2 . . . . . 3 . . . . . 4 5

Not worthy of dissemination, adoption nor implementation	OK to disseminate adopt, and implement **if revised**	OK to disseminate adopt, and implement as is

APPENDIX B

This Appendix contains a one page description of each set of instructional materials from the Middle School Science Study that are discussed in this report. The materials are grouped as follows:

Comprehensive, multiple continuous years, Grade 6 and beyond;

Comprehensive, multiple continuous years, K - 6;

Comprehensive integrated mathematics, science, and technology, Grades 7 - 8;

Single year comprehensive; and

Technology driven supplemental, but material for at least a full year.

Comprehensive 6-10

Title: PRIME Science
Contact: Richard Saykally, U of California Berkeley
Publisher: Kendall/Hunt Publishing
4050 Westmark Dr., P.O. Box. 1840
Dubuque, IA 52004
1-800-258-5622

PRIME Science provides an American adaptation of "Salter's Science"--a well-tested British multi-disciplinary science program for middle grades. The science is balanced - not integrated - between life, earth and physical science, developing conceptual understanding and integrating mathematics, technology and decision-making. The science is rigorous, interesting and useful to the student. Among the major integrative themes that provide structure for grades six through ten are the earth in space, properties of matter, etc. Each unit begins with an application. The teachers' guides are directed at first year teachers, not teaching in their major discipline. Included are student preconceptions, safety, background, ways of introducing the content and assessment items. The visually-stimulating, attractively-designed student supplements for each of the forty units contain the application, a summary of what students should know, what they need to learn, and the activities they can do. The materials were tested and rewritten by teachers and science educators at several sites throughout the U.S.. Professors at University of California/Berkeley reviewed the materials for content accuracy. The British developers were part of the design team. The adaptation involves not only language translation, but changing data to interest American audiences and adding units to meet local interests and frameworks.

Materials Reviewed: Sixth grade materials in developmental form.

Strengths:

1. The program is planned to introduce science content at various grade levels and to revisit it as students advance to later grade levels. Content introduced in the sixth grade might be revisited several times in later grades, giving students opportunities to further develop their own understanding as they mature.
2. The activity-based approach gives students experiences with numerous science concepts in a way they will more likely remember and understand.
3. The teacher materials provide support both for the experienced teachers and those unfamiliar with the content being taught. It is flexible enough to allow teachers to add to the curriculum from other experiences they've had or as opportunities to integrate current events occur.

General Concerns:

1. Efforts should include more of the emerging technologies (e.g., CD-ROM).
2. More of the student challenges should be open-ended to develop inquiry skills.
3. A bigger variety of assessment items is needed.

Comprehensive 6-8

Title: Science 2000
A Middle School Technology Based Curriculum Management Tool

Contact: Ellen M. Nelson

Publisher: Decision Development Corp.
2680 Bishop Dr., Suite 122
San Ramon, CA 94583
510-830-8894

Science 2000 is a multimedia science curriculum for grades 5 - 8, that uses a constructivist pedagogy, a thematic approach and a multi-disciplinary organization of science. At the 6-8 grade levels, four different thematic units integrate materials from earth, life, and physical science leading to a decision-making situation in which students apply knowledge to solve an STS-type problem. Grade 6 units are: Earth's Changing Environments; Growth and Development; Physics of Building; and Chemistry of Food. Eighth grade units are: Genetics and Heredity; Sun and Global Climate Change; Ears to the Sky; and Natural Disasters. The large ideas of science and science as a method of knowing are stressed. Each unit includes: teacher lessons; student activities and bibliographic resources stored in software; a learning resource management tool, compatible with either IBM or MacIntosh computers, which allows teachers to choose, write and edit lessons, assign student activities, access videodiscs and review supplemental material; four videodiscs; eight hands-on activities; and models for pre- and in-service teacher education. Science 2000 correlates to the standards and has been adopted as a textbook alternative in AL, FL, GA, KY, LA, TX, UT, and WV.

Materials Reviewed: Units in grades 6 and 8 were reviewed.

Strengths:

1. The professional quality of the programs and the software are high, video clips and databases are current, and themes and story lines are engaging and appropriate.
2. The materials are diverse enough to support a variety of uses by both inquisitive students and creative teachers.
3. There is very good alignment with standards and the focus on four major questions per year allows in-depth study. The thematic, problem-solving approach is question driven and there are some open-ended questions.

General Concerns:

1. The actual assessment pieces are vague.
2. The program's complexity (extensions and the flexibility) make the program difficult to use. The technology was very difficult to set up. Teachers will need considerable inservice to use this program effectively.
3. The lack of a text may cause problems with parents, and there are no materials for communicating with them.

Comprehensive 6-8

Title: Middle School Science and Technology
Contact: Michael Doherty, Biological Sciences Curriculum Study
Publisher: Kendall/Hunt Publishing CO.
4050 Westmark Dr.
P.O. Box 1840
Dubuque, IA 52004
1-800-258-5622

Middle School Science and Technology is a three-year, activity-based, middle school program for grades 6-8 as a continuation of the BSCS K-6 program. It focuses on the development of the early adolescent, illustrates careers in science, and emphasizes reasoning and critical thinking. The content is structured around major themes of patterns of change, diversity and limits, and systems and change, with emphasis on personal dimensions of science and technology, science and technology in society, technological problem solving, and the nature of scientific explanation. The content is strongest in the life sciences, but generally aligns well with the content recommendations in the National Science Education Standards (NSES).

Material Reviewed: Sixth, seventh and eighth grade materials.

Strengths:

1. Emphasis is on development and use of good pedagogy; for example, the philosophy and approach to cooperative learning is thoroughly explained and consistently used.
2. There is excellent attention to professional development, teaching, program, system, assessment as well as content; there is a high level of consistency with the standards.
3. The "less is more" approach is used to build an accurate understanding overriding concepts and related subconcepts.

General Concerns:

1. The eighth grade materials are not consistent with the format and approach so effectively used for grades 6 and 7. The quality of the introductory units is not the equivalent of the other units.
2. The teacher support materials tend to be wordy to the detriment of easy understanding.
3. There is limited opportunity for students to develop and pursue questions of their own.

Comprehensive K - 6

Title: Science For Life and Living
Contact: Catherine Monson, Biological Sciences Curriculum Study
Publisher: Kendall/Hunt Publishing CO,
4050 Westmark Dr.
P.O. Box 1840
Dubuque, IA 52004
1-800-258-5622

Science for Life and Living is a K-6 elementary science program that encourages students to make decisions and take actions that will improve the quality of their lives. At each grade level, one major concept and one major skill integrate the disciplines, so that students can make meaningful connections between areas of study. For example, Level 1 ideas and concepts are: Introduction to Order and Organization - Objects and Properties (science); Materials and Structures (technology); Safety and Security (health); Major ideas in Levels 2-6 include: Level 2 - Introduction to Change and Measurement; Level 3 - Introduction to Patterns and Predictions; Level 4 - Introduction to Systems and Analysis; Level 5 - Introduction to Energy and Investigation; Level 6 - Introduction to Balance and Decisions. The curriculum uses the BSCS instructional model, is based on constructivist learning theory, integrates cooperative learning and includes kits of hands-on materials and an implementation guide for use by personnel in school districts and school buildings. The components of the program consist of: 1) two teachers' guides in three-ring binders for each level, K-6; 2) student materials for each level; 3) kits of hands-on materials for each level; and 4) an implementation guide for administrators and leadership teams within schools

Materials Reviewed: Two Levels, grades 5 (Energy and Investigation) and 6 (Balance and Decisions) of the curriculum were reviewed. Each level consisted of a teachers' guide in the form of a notebook and a student text. The Implementation guide was also reviewed.

Strengths:
1. Teacher guide takes the teacher step by step - valuable for the science-timid teacher.
2. The materials utilize inexpensive supplies.
3. Team skills are taught.
4. The Implementation Guide for use by districts, principals and schools is excellent.

General Concerns:
1. At times the content appears to be very thin.
2. There is too much focus on terms; the content diagrams are somehow unfriendly.
3. Hands-on, active learning is not always present; activities are more like demonstrations; mostly paper and pencil activities are used.

Comprehensive K-6

Title: Full Option Science System - FOSS
Contact: Lawrence F. Lowry, Lawrence Hall of Science
Publisher: EBEC
310 S. Michigan Ave.
Chicago, IL 60604
1-800-554-9862

The Full Option Science System (FOSS) for grades K-6 is offered to schools as a collection of stand-alone modules on different topics appropriate for students in grades K - 6. The module consists of a kit of student materials, a detailed teacher guide, and a teacher preparation video. The activities are organized into four strands: Life Science, Physical Science, Earth Science, and Scientific Reasoning and Technology. There are five unifying themes that thread through the modules of the program: Pattern, Structure, Interaction, Change, and System. Student assessment suggestions are included. Four modules in any academic year would easily constitute a complete curriculum. Eight modules (two in each strand) have been developed to be appropriate for students in sets of grades K-2, 3-4, 5-6. There are two versions of all student materials packaged in each guide, Spanish and English. There are also suggestions for cultural enrichment, sensitivity to cultural difference, and sheltered instruction. FOSS employs cognitive and social constructivist approaches to science instruction. Students work in collaborative groups of four to maximize effective use of materials and promote student/student interactions. Fundamental academic skills of language and mathematics are integrated into all activities, and guidance is provided to help teachers lead productive discussions.

Materials Reviewed: Units reviewed were Life Science: Food and Nutrition, Environments; Physical Science: Levers and Pulleys, Mixtures and Solutions; Earth Science: Solar Energy, Landforms.

Strengths:
1. Materials are user friendly; clear and clean; teacher guides and video are excellent.
2. Built on strong psychological and teaching research foundation.
3. There is strong science content with a good balance of depth and breath .
4. Children will enjoy the cleverly designed activities and materials.
5. Assessments are strong; questioning approaches push teachers about the types of questions to ask.

General Concerns:
1. Much of "doing science" excellent, but materials do not encourage students to ask their own questions.
2. Materials provide guided inquiry, but little open-ended inquiry.
3. Bibliography and history of science is thin.

Comprehensive K-6

Title: Insights: A Hands-on Inquiry Science Curriculum
Contact: Karen Worth, Education Development Center
Publisher: Optical Data Corporation
30 Technology Dr.
Warren, NJ 07059
1-800-248-8478

EDC Insights is a hands-on, inquiry-oriented science program designed for self contained elementary classrooms. The science is appropriate and current and supplies required are inexpensive and easy to obtain. These materials are designed to improve students' abilities to think critically, use language, and solve problems using the natural world as an experimental base. Since urban systems face extremely complex problems, the science materials are specifically aimed at these systems. There is a balance of life, physical, and earth sciences, tying the experiential base to the urban setting where appropriate. The materials integrate science with the rest of the elementary curriculum, particularly language arts and mathematics.

Materials Reviewed: Six units were reviewed--Changes of State, Grades 4/5; The Mysterious Powder, Grades 4/5; Reading the Environment, Grades 4/5; Structures, Grade 6; There is No Away, Grade 6; Human Body Systems, Grade 6.

Strengths:
1. Important topics for age level with appropriate and current science.
2. The supplies called for are inexpensive.
3. Activities stretch over a period of time and allow exploration on the part of students.
4. Effective sequencing of the curriculum within the units, (i.e., activities), provides good guidance for teachers. Assessments are also good.

General Concerns:
1. Minor errors and inconsistencies exist and should be edited out.
2. The amount of information provided to teachers in the background text appears insufficient.
3. Assessment questions need to focus on topics that are familiar/accessible to all students (example of bicycle activity would leave no-bikers at a disadvantage).

Comprehensive K-6

Title: Science and Technology for Children
Contact: Douglas M Lapp, National Sciences Resources Center, Smithsonian Institution and National Academy of Sciences
Publisher: Carolina Biological Supply Co.
2700 York Rd.
Burlington, NC 27215
1-800-227-1150

The National Science Resources Center (NSRC) joined with the National Academy of Sciences and the Smithsonian Institution to bring together teachers, educators and scientists with a great diversity and richness of experience to create and disseminate an innovative elementary science program for grades one through six called Science and Technology for Children (STC). Twenty four hands-on, inquiry-centered units constitute a complete elementary science program for grades one through six. In addition, there are 16 science readers to complement the 16 STC units for grades three through six. Each STC unit provides children with the opportunity to learn in-depth about topics in the physical, life or earth sciences and technology through direct observation and experimentation. The units invite children to develop hypotheses, then to test their ideas, just as professional scientists do. Along the way, children develop patience, persistence, and confidence in their own ability to tackle and solve real problems. The teachers act as guides to the hands-on learning, encouraging students to explore new ideas for themselves and expand their understanding of the world around them. School districts are able to use these materials either as a complete elementary science program or individually, as a supplement to an existing science program. These materials are designed to meet the needs of elementary school children from diverse cultural and ethnic backgrounds.

Materials Reviewed: Of the 24 units, the units considered appropriate for 5th and 6th grades were Food Chemistry, Electric Circuits, Ecosystems, Animal Studies, Microworlds, Experiments with Plants, Measuring Time, and Floating and Sinking.

Strengths:
1. Carefully sequenced, hands-on activities designed to lead to conceptual development are present.
2. Rich, strong, and accurate science content is a real strength.
3. Positive alignment with standards, including technology content and assessment.

General Concerns:
1. The materials are very teacher directed, with insufficient opportunity for students to ask and answer their own questions.
2. The Teachers Guide has too much information that is hard to locate and use.

Integrated Comprehensive 7-8

Title: Integrated Mathematics, Science, and Technology (IMaST)
Contact: Franzie Loepp, Illinois State University
Publisher: Glen Co. Macmillan
3008 West Willow Knolls Dr.
Peoria, IL 61614
309-438-3089

The Integrated Mathematics, Science, and Technology (IMaST) program is centered around the topics of biotechnology, manufacturing and forecasting. Each unit includes objectives, experiential learning, appropriate use of multimedia, and appropriate technology and evaluation instruments. The materials motivate students, especially those from groups underrepresented in technological careers, to learn the foundation mathematics, science and technology concepts by involving them in enriched learning experiences relevant to their daily lives. The materials are designed to be used by mathematics, science and technology teachers concurrently over a nine week school session. Assessment activities designed for mathematics, science and technology are included. Though some content areas are not addressed, there is generally excellent content alignment with the National Science Education Standards (NSES).

Materials Reviewed: Seventh grade materials. The eighth grade materials are under development.

Strengths:
1. The materials and activities apply a hands-on approach.
2. The content and activities in science, mathematics, and technology are integrated and there is a well represented progression of ideas and skills. The technology and science knowledge is current.
3. The program provides teacher materials and activities as a basis for an integrative approach to learning.

General Concerns:
1. The programs activities and approaches are somewhat prescriptive.
2. It is not clear that there is sufficient attention to activities for students with high potential in science, mathematics and/or technology.
3. The format of the program is not teacher friendly.
4. Implementation of the program may be difficult. The design of the program which has three teachers teaching the program concurrently, may not fit into the schedule of some schools.

Single Year Comprehensive

Title: Event-Based Science: Earth Science

Contact: Russell Wright
Montgomery Co. Public Schools
850 Hungerford Dr., Rockville, MD 20850

Publisher: Addison - Wesley Publishing Co.
Route 128
Reading, MA 01867
1-800-552-2259

These materials provide a year-long, event-based science (EBS) curriculum for heterogeneously grouped middle school students in grades 6 - 9 for use primarily in departmentalized earth science classes. EBS is different from other approaches to science instruction and curriculum writing. The event focus (e.g., earthquakes, volcanoes, tornadoes) makes each unit topical and relevant to early adolescents. It allows science to become less compartmentalized. It allows for a natural highlighting of nontraditional roles filled by women and minorities. High interest activities are models for other activities. The approach taken by EBS requires students to explore other sources of information (biographies, newspapers) in order to complete class assignments. EBS stresses alternative assessment techniques and grading strategies which reward success and downplay failure. Nationally disseminated products include a textbook, teacher resource notebook, and video tape and/or videodisc support.

Materials Reviewed: All current modules and 2 pilot test modules were reviewed.

Strengths:

1. The materials have a strong inquiry focus.
2. The materials are highly student-centered with relevant tasks.
3. There are good uses of authentic assessment.
4. The modules are interchangeable.

General Concerns:

1. There are a limited number of science activities.
2. Videos could be made more content-rich (but the current "hook" they provide is well done).
3. Some pilot test modules contain content errors and are not generally as engaging as the earlier work.

Single Year Comprehensive

Title: Science Education for Public Understanding Program (SEPUP): Issues-Oriented Science for Secondary Schools

Contact: Herbert D. Thier, University of California, Berkeley

Publisher: LAB-AIDS Inc.
17 Colt Court
Ronkonkoma, NY 11779
516-737-1133

The Science Education for Public Understanding Program (SEPUP) materials support two one year courses of study: a concrete course for middle school and a course emphasizing global issues for high school. The courses stress issues-oriented science and the use of scientific evidence and risk-benefit analysis in making decisions. These courses continue the emphasis of the Chemical Education for Public Understanding Program (CEPUP) societal issues involving the use of chemicals and expand the scope by dealing with other issues in life, earth and physical sciences and in technology. Eight modules cover many of the large themes of science proposed in Project 2061 along with issue-oriented themes such as evidence based decision-making, uncertainty and controversy, science and social systems. Materials include a teacher's resource book, a student text, projects and extension activities, kits videotapes and software. Assessment of student learning is built into the materials. Note: A set of life science modules for SEPUP are now under development.

Materials Reviewed: All four sections of *Issues, Evidence and You* were reviewed.

Strengths:

1. The materials are engaging, provide good activities for student decision-making, and opportunities for student-designed inquiry.
2. The scope and sequence allow for conceptual growth.
3. There is an excellent assessment component.

General Concerns:

1. Materials cannot be used yet as a "full" curriculum; additions are needed in the areas of life and earth science.
2. There is limited use of educational technology.

Single Year Comprehensive

Title: Chemical Education for Public Understanding Project
Contact: Herbert D. Thier, University of California, Berkeley
Publisher: LAB-AIDS Inc.
17 Colt Court
Ronkonkoma, NY 11779
516-737-1133

The Chemical Education for Public Understanding Project (CEPUP) at the Lawrence Hall of Science has developed twelve modular sets of interdisciplinary materials for use at the middle/junior high school level that can comprise a one year course. The content is up-to-date, accurate, and gives students opportunities to study materials in depth through active application of concepts. The materials introduce students to scientific concepts in chemistry and their interaction with people and the environment. CEPUP materials highlight areas of direct societal concerns associated with science and technology. Students are given chemistry-based laboratory investigations and experiments that focus on the environment, biotechnologies, industrial processes, agricultural practices, alternative energy sources and health science.

Materials Reviewed: The Teacher's Guide including student sheets, and Guide for Implementation were reviewed. All twelve modules were examined.

Strengths:
1. The materials address real life issues and give students multiple opportunities to apply chemistry.
2. The focus on interdisciplinary topics is one that many middle school teachers and students will find appealing.
3. The modular format is a strength.
4. These materials help students develop good data skills.

General Concerns:
1. The classroom assessments emphasize written tests; many potential alternative assessments aren't developed.
2. The materials emphasize scientific processes and don't sufficiently emphasize scientific theory and models.

Single Year Comprehensive

Title: Junior High/Middle School Life Science Program
Contact: Harold Pratt, Jefferson Co Public Sch
Publisher: Kendall/Hunt Publishing Co.
4050 Westmark Dr., P.O. Box 1840
Dubuque, IA 52004
1-800-258-5622

The Jefferson County Colorado Public School System developed materials that constitute a year long junior high/middle school program in life science which emphasizes the understanding and care of the human body. The development was done in close cooperation with the University of Colorado Health Sciences Center and with the support of local physicians and university-level scientists and science educators. The program provides an alternative for teachers and schools seeking materials to improve their life science curriculum and serves as a resource for schools seeking to integrate health topics with their existing life science course. General topics included in the materials are life science, human biology and reproduction, ecology, cells, and genetics. The life science, although only in the context of human biology, aligns well with the National Science Education Standards (NSES). Part of the program directs students toward an ability to make decisions in and about their local environment. Materials include student text and investigations, an extensive Teachers' Guide, the Teacher's Resource Book (which includes transparency masters, worksheets, etc.), and a Guide for Implementation.

Materials Reviewed: The student text and investigations, Teacher's Guide, Teacher's Resource Book, and Implementation Guide were reviewed.

Strengths:
1. The materials contain a strong activity orientation and many students will find them engaging.
2. The materials explicitly help students move from the big picture to smaller ideas.
3. The materials provide good teacher support.
4. The health-related topics contain sensitive treatment of key issues in language appropriate for middle school students.

General Concerns:
1. The materials are weak in student assessments.
2. Students are not encouraged to design their own investigations.
3. This curriculum is overstuffed - there is more material presented than students can be reasonably able to learn, and much of it focuses on facts and vocabulary.

Supplemental Technology Driven

Title: National Geographic Kids Network
Contact person: Daniel Barstow, TERC Inc.
Publisher: National Geographic Society
Educational Services
Dept. 89
Washington, DC 20036

These materials extend those developed for grades 4-6 with nine units (or approximately ninety weeks) of supplementary science material targeted for grades 7-9 and organized around telecommunications-based collaborative student research. The materials contain coordinated curriculum and software. The materials were designed by TERC in collaboration with the National Geographic Society (NGS). Each unit requires students to gather data, share these data over a telecommunications network with students in other school districts, and analyze the collected data. This allows students to perform like scientists. Before gathering the data. students study the underlying science content and learn the experimental skills required to perform appropriate measurement. Following data collection, students apply data analysis techniques and reflect on the social significance of the problem addressed in the study. Study areas proposed include: Conditions for Growth, Trees, Student Fitness, Acid Deposition, Recycling and Composting, Radon, Alternative Energy sources, Automobile Accidents, and Greenhouse Gasses. The materials include a Teacher's Guide, Readings, Student Lab Sheets, Assessments, Overhead Transparencies, Posters, Works and Reference diskettes, and a "Quick Guide to Using NGS Works."

Materials Reviewed: The unit, "What is our Soil Good For?" was reviewed.

Strengths:
1. Technology is used well as a tool in these materials.
2. There is a good focus on science as inquiry.
3. The data collection/analysis activities are strong.
4. The materials permit students to explore science experiences in depth.

General Concerns:
1. The materials are expensive, the software is complicated and difficulties can be anticipated in its use.
2. The technology is not used to its full potential. There is a lack of graphics, the menus are tedious, and data analysis tools weak.
3. These materials do not comprise a full year program.

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